

**REMEDIAL INVESTIGATION AND FEASIBILITY STUDY  
FINAL WORK PLAN  
EXTERIOR INDUSTRIAL WASTE DITCH  
NAVAL REACTORS FACILITY  
IDAHO FALLS, ID**

**APPENDIX F**

**INEL AND NRF BACKGROUND AND PHYSICAL SETTING**

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### **ACKNOWLEDGEMENT**

Some of the information presented in this Appendix regarding geology, hydrology, meteorology climate and ecology with the INEL was obtained from the "Draft Work Plan for the Organic Contamination in the Vadose Zone-Operable Unit (OU 7-08), Remedial Investigation/Feasibility Study, December 1991, Idaho National Engineering Laboratory, EG&G Idaho, Inc. Specific references are not made to this document, but rather to the base documents as indicated.

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## **1.0 INTRODUCTION**

This Appendix provides information on the history, geology, meteorology, hydrology, flora, and fauna of the INEL and NRF. This information was used in developing the Industrial Waste Ditch Remedial Investigation and Feasibility Study Work Plan.

### **1.1 INEL Location Description**

The surface of the INEL is a relatively flat, semi-arid, sagebrush desert with the predominant relief either as volcanic buttes jutting from the desert floor or as unevenly surfaced basalt flows and/or flow vents and fissures. Elevations on the INEL range from 5200 feet in the northeast to 4750 feet in the central lowlands; the average elevation is 4975 feet (see Figure F-1).

### **1.2 History of the INEL**

The INEL site was established in 1949 as the National Reactor Testing Station by the U.S. Atomic Energy Commission as a site for building, testing, and operating various nuclear reactors, fuel processing plants, and support facilities with maximum safety and isolation. In 1974, the National Reactor Testing Station was redesignated as the INEL to reflect the broad scope of engineering activities conducted there.

The U.S. government used portions of the site prior to its establishment as the National Reactor Testing Station. During World War II, the U.S. Navy used about 270 square miles of the site as a gunnery range. Another area was once used by the U.S. Army Air Corps as an aerial gunnery range. The present INEL site includes all of the former military area and a large adjacent area withdrawn from the public domain for use by DOE. The former Navy administration shop, warehouse, and housing area is today the Central Facilities Area of the INEL.

## **2.0 PHYSICAL CHARACTERISTICS**

### **2.1 Meteorology**

Atmospheric contaminant transport is controlled by the following physical parameters; climate, local meteorology, local topography and large structures or buildings on-site, and contaminant source strength. This section describes the aspects of these physical parameters necessary to evaluate environmental and human health impacts due to atmospheric transportation of contaminants from NRF.

### **2.2 Climate**

The climate at INEL is influenced by the Rocky Mountains and the Snake River Plain, creating a semi-arid climate with an average summer daytime maximum temperature of 28°C (83°F) and an average winter daytime maximum temperature of -0.50°C (31°F). Infrequent cloud cover over the region allows intense solar heating of the ground surface during the day and the low absolute humidity allows significant radiant cooling at night. These factors create large temperature fluctuations near the ground (Bowman et al., 1984). During a 22-year period of meteorological records (1954-1976), temperature extremes at the INEL have varied from a low of -41°C (-43°F) in January to a high of 39°C (103°F) in July. The average relative humidity at the INEL ranges from a monthly average minimum of 15% in August to a monthly average maximum of 81% in February and December. The relative humidity is directly related to diurnal temperature fluctuations. Relative humidity reaches a maximum just before sunrise (the time of lowest temperature), and a minimum in the late afternoon (time of maximum daily temperature) (EG&G, 1981).

The regional topography and upper-level wind patterns over North America create a semi-arid climate. Average annual precipitation at the INEL is 8.5 inches. The highest precipitation rates occur during the months of May and June, and the lowest rates are in July.

Snowfall at the INEL ranges from a low of about 12 inches per year to a high of about 40 inches per year, with an annual average of 26 inches. Normal winter snowfall occurs from November through April, although occasional snow storms occur in May, June, and October (EG&G, 1981).

Potential annual evaporation from saturated ground surface at the INEL is approximately 36 inches. Eighty percent of this evaporation occurs between May and October. During the warmest month (July), the potential daily evaporation rate is approximately 0.25 inches per day. During the coldest months (December through February), evaporation is low and may be insignificant. Actual evaporation rates are much lower than potential rates because the ground surface is rarely saturated. Evapotranspiration by the sparse native vegetation of the Snake River Plain is estimated at between six to nine inches per year, or four to six times less than the potential

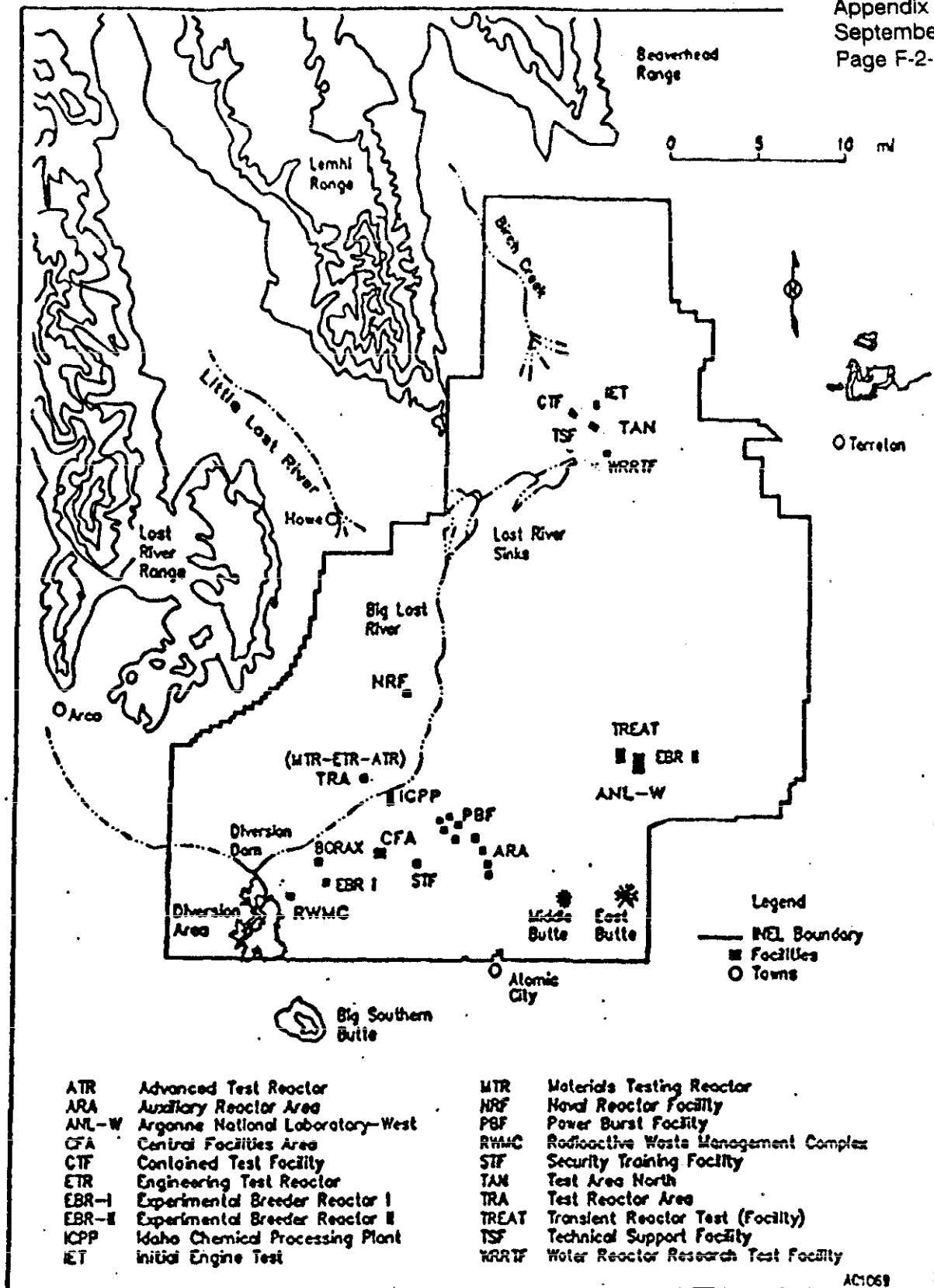


Figure F-1 Map of the INEL and Surrounding Area

evapotranspiration. The greatest quantity of precipitation water available for infiltration (late winter to spring) coincides with periods of relatively low evapotranspiration rates (EG&G, 1981).

### **2.3 Local Meteorology**

The local topography influences the local meteorology. The orientation of the bordering mountain ranges, as well as the general orientation of the eastern Snake River Plain, play an important role in determining the wind regime. The INEL lies in the belt of prevailing westerly winds, normally channeled across the eastern Snake River Plain. This channeling usually produces a west-southwest or southwest wind. When the prevailing westerlies at the gradient level (approximately 5000 feet above land surface) are strong, the winds channeled across the eastern Snake River Plain between the mountains become very strong. Some of the highest wind speeds at the INEL have been observed under these meteorological conditions. High winds occur with the greatest frequency in the spring.

Local mountain and valley features exert a strong influence on the wind flow under other meteorological conditions. When winds above the gradient level are strong and from a direction slightly north of west, channeling in the eastern Snake River Plain usually continues to produce southwesterly winds over most of the INEL. At the mouth of Birch Creek however, the northwest to southeast orientation of this valley channels strong north-northwest winds into the area. This "Birch Creek" wind may equal the strongest southwesterly winds recorded at other locations on the INEL (EG&G, 1988).

Drainage winds also contribute to the overall wind flow over the INEL. On clear or partly cloudy nights with only high thin clouds, the valley experiences rapid surface radiant cooling. This results in simultaneous cooling of the air near the surface, which causes the air to become stable and less turbulent. However, air along the slopes of mountains cools at a faster rate than air at the same elevation located over the valleys. Consequently, the air increases in density and flows or sinks toward the valley, forming a down-slope wind. When this wind reaches the valley, it still flows toward lower elevations and becomes a down-valley wind. Nocturnal down-valley flow is the second most frequent wind observed over the INEL and flows primarily out of the north-northeast.

A reverse flow, opposite in direction to that of the drainage wind, occurs during the daytime when air along the mountain slopes heats more rapidly than air at the same elevation over the valley. Air rises along the slopes as it loses density. This up-slope wind, in turn, contributes to the production of an up-valley wind. This up-valley wind is seldom detectable as a separate component of the wind until the synoptic pressure gradient becomes quite weak. Although the mountain and valley winds are predominantly "fair weather" phenomena, they can also occur under other sky cover conditions.

In addition to the relatively local drainage winds, a somewhat stronger wind has occasionally been observed. It develops when an outbreak of cold air east of the Continental Divide occurs and behaves in the same manner as the down-valley wind. If the cold air becomes deep enough, it spills over the Continental Divide and flows down across the eastern Snake River Plain. The result of this phenomenon is valley winds from the northeast.

Pressure gradient forces related to passing synoptic weather systems, as well as local storms, all affect the winds of the INEL. These storms alter the local flow regime such that winds can be observed from any direction.

High wind-speed episodes occur in all months of the year, with the highest average hourly winds occurring during winter and spring. The passage of synoptic frontal systems involves higher and more sustained average hourly wind-speed events than those of thunderstorm gust fronts (Bowman et al., 1984).

The INEL is subject to severe weather episodes throughout the year. Thunderstorms with occasional tornadoes are observed mostly during the spring and summer. An average of two to three thunderstorms occur during each of the months from June through August (EG&G, 1981). Thunderstorms may be accompanied by strong, gusty winds that may produce local dust storms. Occasionally, rain in excess of the long period average monthly total precipitation may be recorded at a monitoring station on the INEL resulting from a single thunderstorm (Bowman et al., 1984). Precipitation from thunderstorms at the INEL is generally light.

Dust devils are also common in the region. Dust devils entrain dust and pebbles and transport them over short distances. They usually occur on warm sunny days with little or no wind. The dust cloud may be several hundred yards in diameter and extend several hundred feet in the air (Bowman et al., 1984).

The vertical temperature and humidity profiles in the atmosphere determine the atmospheric stability. Stable atmospheres are characterized by low levels of turbulence and less vertical mixing. This results in higher ground level concentrations of emitted contaminants. The stability parameters at the INEL range from extremely stable to very unstable. The stable conditions occur mostly at night during strong radiant cooling. Unstable conditions can occur during the day when there is strong solar heating of the surface layer, or whenever a synoptic scale disturbance passes over the region.

## **2.4 Local Topography**

The terrain in and around the INEL may affect the ambient ground-level concentrations of contaminants emitted from NRF. Land features located above the elevation of the source may create relatively higher ambient concentrations than features located at the same elevation as the source. The

overall terrain at the INEL is flat with some small depressions and mounds, and small buttes.

## **2.5 Large Structures and Buildings**

Buildings and large structures can increase the degree of turbulence in the air. The dispersion of contaminants is directly related to the degree of air turbulence. The largest buildings at NRF are about 100 feet tall. The profile of these buildings will not significantly affect the degree of turbulence at the INEL. NRF can, therefore, be characterized as rural for dispersion analysis purposes.

### 3.0 GEOLOGY

The NRF is located on the eastern Snake River Plain, a broad flat plain consisting of basaltic lava flows with thicknesses up to several thousands of feet and interbeds of loess, eolian sediments, alluvial fan deposits, and lacustrine sediments. The upper 700 feet of basaltic lavas at the NRF were the result of ten eruptive episodes occurring from about 75,000 to 600,000 years ago (Anderson and Lewis, 1989; and Kuntz et al., 1980). The flows erupted from fissure vents in volcanic rift zones, the majority of which trend northwest along the northeast eastern Snake River Plain. The rift zones are thought to be associated with extension tectonics caused by the continuation of the Basin and Range tectonism (EG&G, 1984). The basaltic lavas are underlain by rhyolitic volcanic rocks. Several of the rhyolitic domes have erupted through the basaltic pile near the INEL's southern boundary.

#### 3.1 Physiography

The Snake River Plain is the largest continuous physiographic feature in southern Idaho (Figure F-2). This large topographic depression extends from the Oregon border, in an area across Idaho to Yellowstone National Park, and into northwestern Wyoming.

The Snake River Plain slopes upward from an elevation of about 2500 feet at the Oregon border to over 6500 feet at Henry's Lake near the Montana-Wyoming border. The Snake River Plain is composed of two structurally dissimilar segments, with the division occurring near Twin Falls, Idaho. West of Twin Falls, the Snake River cuts a valley through Tertiary Basin fill sediments and interbedded volcanic rocks. The stream drainage is well developed, except in a few areas covered by recent thin basalt flows. East of Bliss, Idaho, the complexion of the plain changes as the Snake River carves a vertical-walled canyon through thick sequences of Quaternary basalt with few interbedded sedimentary deposits.

The INEL is located entirely on the northern side of the eastern Snake River Plain and adjoins the mountains to the northwest that make up the northern boundary of the plain. Three mountain ranges end at the northern and northwestern boundaries of the INEL: the Lost River Range; the Lemhi Range; and the Beaverhead Mountains of the Bitterroot Range (Figure F-2). Saddle Mountain Peak, near the southern end of the Lemhi Range, reaches an altitude of 10,795 feet and is the highest point in the area.

The portion of the Snake River Plain occupied by the INEL may be divided into three minor physical provinces; a central trough that extends to the northeast through the INEL, and two flanking slopes that descend to the trough, one from the mountains to the northwest and the other from a broad ridge on the plain to the southeast. The slopes on the northwestern flank of the trough are mainly alluvial fans originating from sediments of Birch Creek and the Little Lost River.

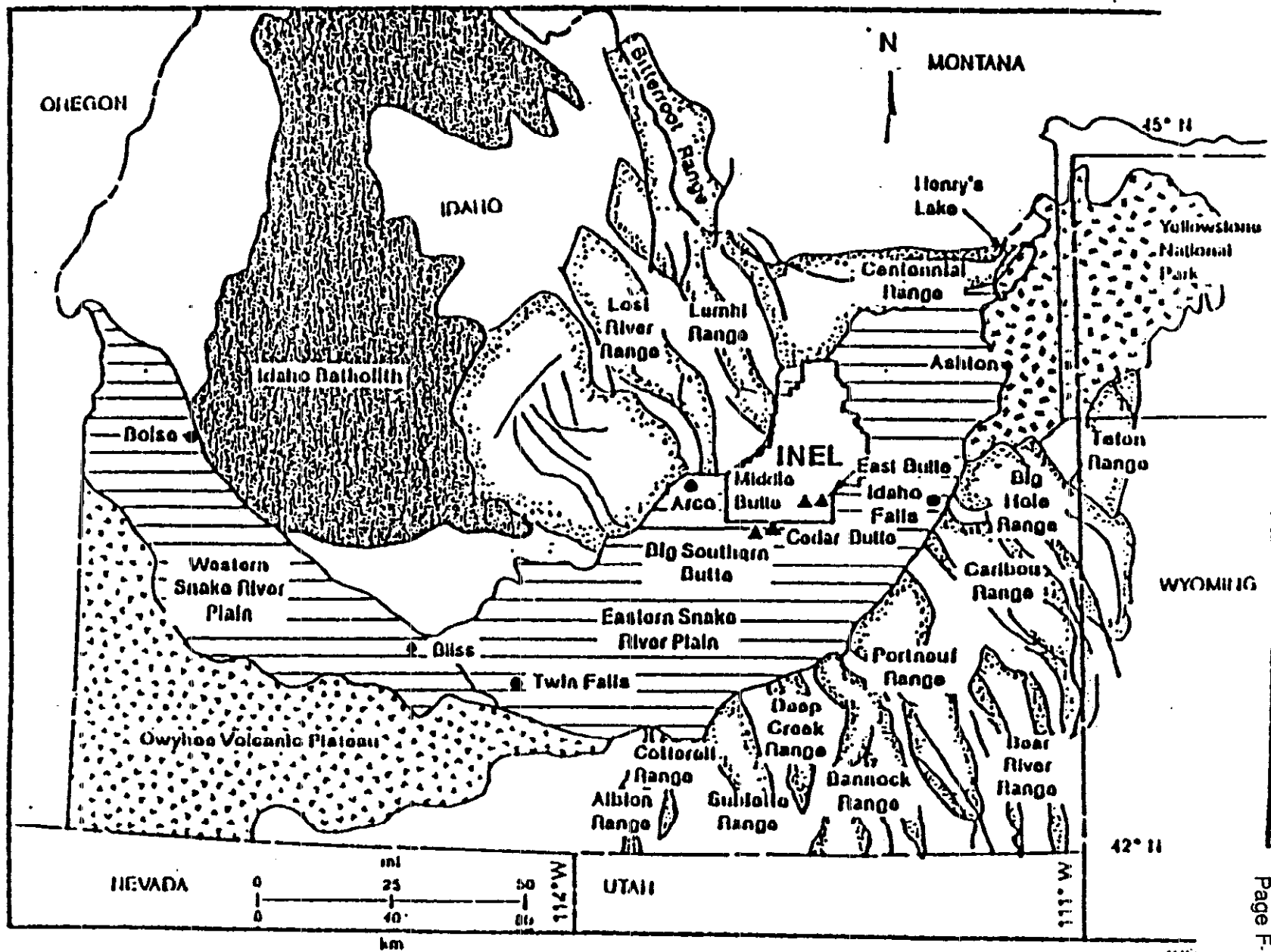


Figure F-2 Physiographic Features of the INEL Area

Also forming these gentle slopes are basalt flows that have spread onto the plain (Figure F-3). The landforms on the southeast flank of the trough are formed by basalt flows, which spread from an eruption zone that extends northeast from Cedar Butte (Figure F-2). The lavas that erupted along this zone built up a broad topographic swell directing the Snake River to its current course along the southern and southeastern edges of the plain. This ridge effectively separates the drainage of mountain ranges northwest of the INEL from the Snake River. Big Southern Butte and the Middle and East Buttes are aligned roughly along this zone; however, they were formed by viscous rhyolitic lavas extruded through the basaltic cover and are slightly older than the surface basalts of the plain.

The central lowland of the INEL broadens to the northeast and joins the extensive Mud Lake Basin. The Big and Little Lost Rivers and Birch Creek drain into this trough from valleys in the mountains to the north and west. The intermittently flowing waters of the Big Lost River have formed a flood plain in this trough, consisting primarily of sands and gravels. The streams flow (intermittently) to the Lost River Sinks, a system of playa depressions in the northeast portion of the INEL, south of the town of Howe. There, the water either evaporates, transpires, or recharges the Snake River Plain Aquifer. The sinks area covers several hundred acres and is very flat, consisting of significant thicknesses of fluvial and lacustrine sediments.

### **3.2 Formation of the Snake River Plain**

Southern Idaho has been characterized by a bimodal basalt-rhyolite style of volcanism over the past 15 million years. This volcanism has occurred as two general periods. The first period consisted of the extrusion of rhyolitic lavas and tuffs interrupted by smaller basaltic outflows that have continued until recent times. The focus of this volcanism has progressed over time in a northeasterly trend from the Miocene to the present time and is currently located beneath the Yellowstone Plateau. The eruption of rhyolitic lavas associated with this first period has occurred at the Yellowstone Plateau as recently as 70,000 years ago.

The Snake River Plain is a 60 mile wide basin extending 200 miles from near Twin Falls, Idaho to the Island Park Caldera north of Ashton, Idaho, and is composed of two structurally dissimilar segments (Figure F-2). The eastern Snake River Plain is considered a down-warped structure and not necessarily bounded by faults. It consists of a series of rhyolitic calderas overlain by a veneer of basalts.

The earliest dated rhyolitic activity on the eastern portion of the Snake River Plain began about 10 million years ago in the Twin Falls area. According to Leeman, this silicic volcanism was followed by basaltic lavas that extruded from vents along northwest-trending rift zones. The volcanic material is dominated by rhyolite ash flow tuffs and lava flows to a thickness of greater than 7800 feet. The silicic volcanic rocks are overlain by as much as 2000 to 3000 feet of basaltic lava flows and interbedded sediments (Robertson et al., 1974).

Basalt flows have erupted from four postulated rift zones that cross the Snake River Plain trending northwest-southeast. These rifts are defined by the linear arrangement of vents, fissures, and graben. Dating of basalt flows on and near the INEL yields eruption dates of 12,000 to 400,000 years ago. The Hells-Half-Acre flow, immediately adjacent to the southeastern INEL boundary, is dated at 4100 years. The youngest basalt flows on the Snake River Plain occur along the Great Rift at the Craters of the Moon National Monument and are 2100 years old.

### **3.3 Surface Geology**

The general surface geology of the INEL is shown in Figure F-3. Much of the surface is covered by Pleistocene and Holocene basalt flows. The second most prominent geologic feature is the flood plain of the Big Lost River. Alluvial sediments of Quaternary age occur in a band that extends across the INEL from the southwest to the northeast. The alluvial deposits grade into lacustrine deposits in the northern portion of the INEL, where the Big Lost River enters a series of playa lakes. Paleozoic sedimentary rocks comprise a minute area of the INEL along the northwest boundary. Three large silicic domes and a number of smaller basalt cinder cones occur on the INEL and along the southern boundary.

### **3.4 Subsurface Geology**

A number of wells have been drilled on the INEL to monitor groundwater levels and water quality. Lithologic and geophysical logs have been made for most of the wells drilled on the INEL. From these logs and an understanding of the volcanism of the Snake River Plain, it is possible to develop a reasonably comprehensive picture of subsurface geology. The INEL Site is very homogeneous in terms of mode of formation and types of geologic units encountered. The exact distribution of units at any specific site, however, is highly variable.

The eastern Snake River Plain typifies a "plains" style of basaltic volcanism with the accumulation of basaltic flow materials by three general methods: (a) flows forming low-relief shield volcanos; (b) fissure-fed flows; and (c) major tube-fed flows with other minor flow types. These distinct flow types often intermingle with the tube and fissure-fed flows filling in the lower regions between low-relief shield volcanos. This results in a relatively low surface gradient, often with

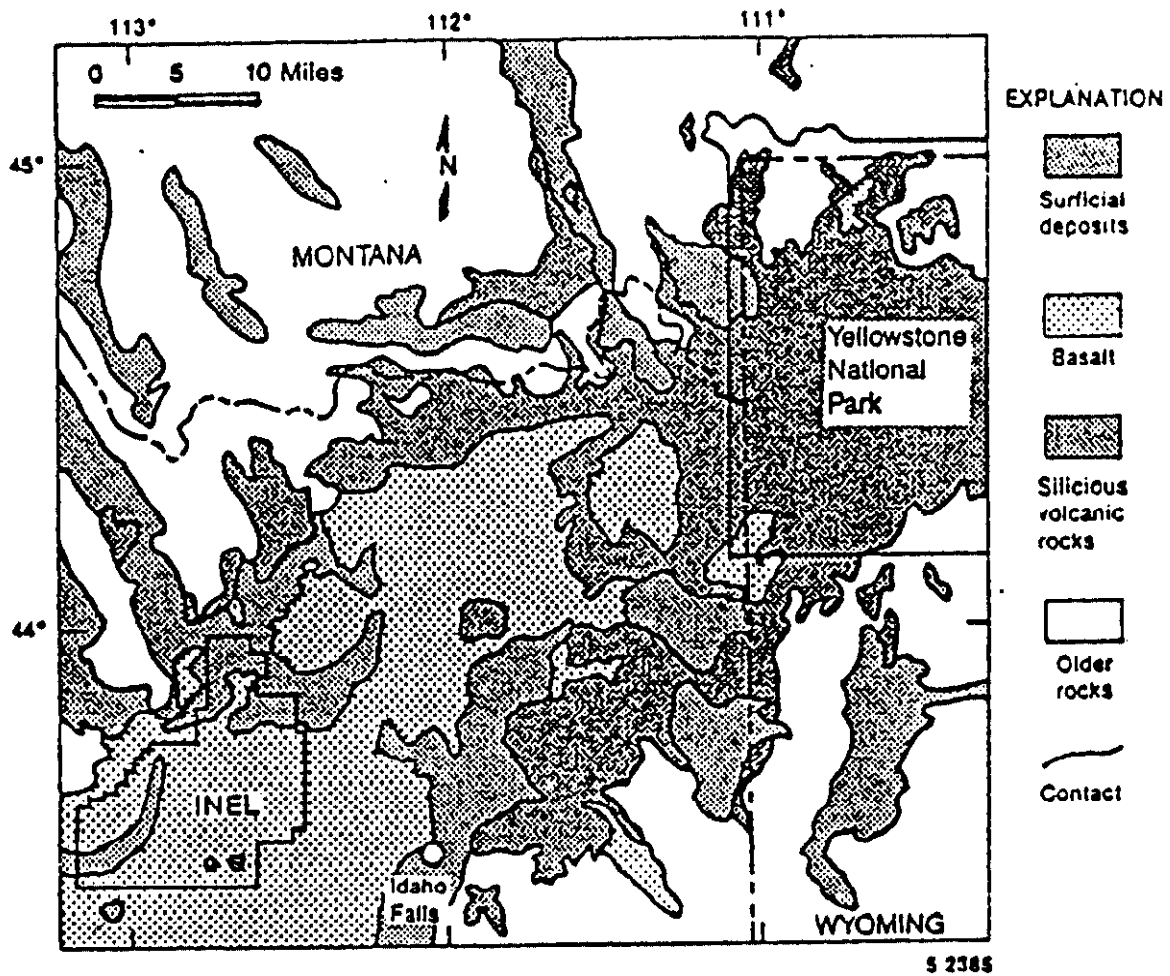


Figure F-3 Geological Features of the INEL Area

complex stratigraphic relations as displayed in Figure F-4. Relatively minor accumulations of basaltic cinders or scoria occur in plains type volcanism; this can be as relatively rare cinder cones or as thin accumulations between flows. Basalt flows characteristically occur as layers of pahoehoe lava a few feet to a few tens of feet thick, with an average thickness on the order of 53 feet (Nace et al., 1956). The basalt flows can be interlayered with unconsolidated sediments, scoria, and breccia. Considerable variation in lithologic texture occurs between different flows, as well as within individual flows.

The bases of many flows are glassy to fine-grained and minutely vesicular. The mid-portions of flows are coarser grained with few vesicles. The upper portions of flows are fine-grained with many small vesicles. This pattern results from rapid cooling of the upper and lower surfaces with slower cooling of the basalt flow's interior. The massive basalt flows' interior are generally jointed, with vertical joints in a hexagonal pattern that were formed during cooling. Basalt flows that were exposed at the surface for a significant time have vesicles and fractures filled with fine-grained sediments and secondary calcite. During quiescent periods between volcanic eruptions, sediments were deposited upon the basalt surfaces. These sedimentary deposits display a wide range of grain size distributions, depending on the mode of deposition--eolian, lacustrine, or fluvial. Because of the very irregular topography of the basalt flows, isolated depressions are common. Thus, many small pockets of sedimentary material may occur in a sequence of basalt flows.

The Big Southern Butte Complex is approximately 300,000 years old, and is one of several complexes believed to have erupted from rhyolitic calderas aligned in a northeast trending belt. These rhyolites apparently consisted of very viscous lavas which intruded as domes, representing the waning stages of explosive silicic volcanism (Bowman et al., 1984). Descriptions of the INEL fault studies, seismology, and volcanic hazards, along with some geologic maps for the INEL, are summarized in Bowman et al. (1984).

The eastern Snake River Plain is bounded on the north and west by Cenozoic fault-block mountains of the Lost River, Lemhi, and Beaverhead Ranges (Figure F-2). These ranges are composed of Paleozoic quartzites, limestones, dolomites, and shales. The fault-block ranges trend northwest-southeast and the volcanic rifts parallel the ranges, and are believed to be surface expressions of extensions of the range-front faults.

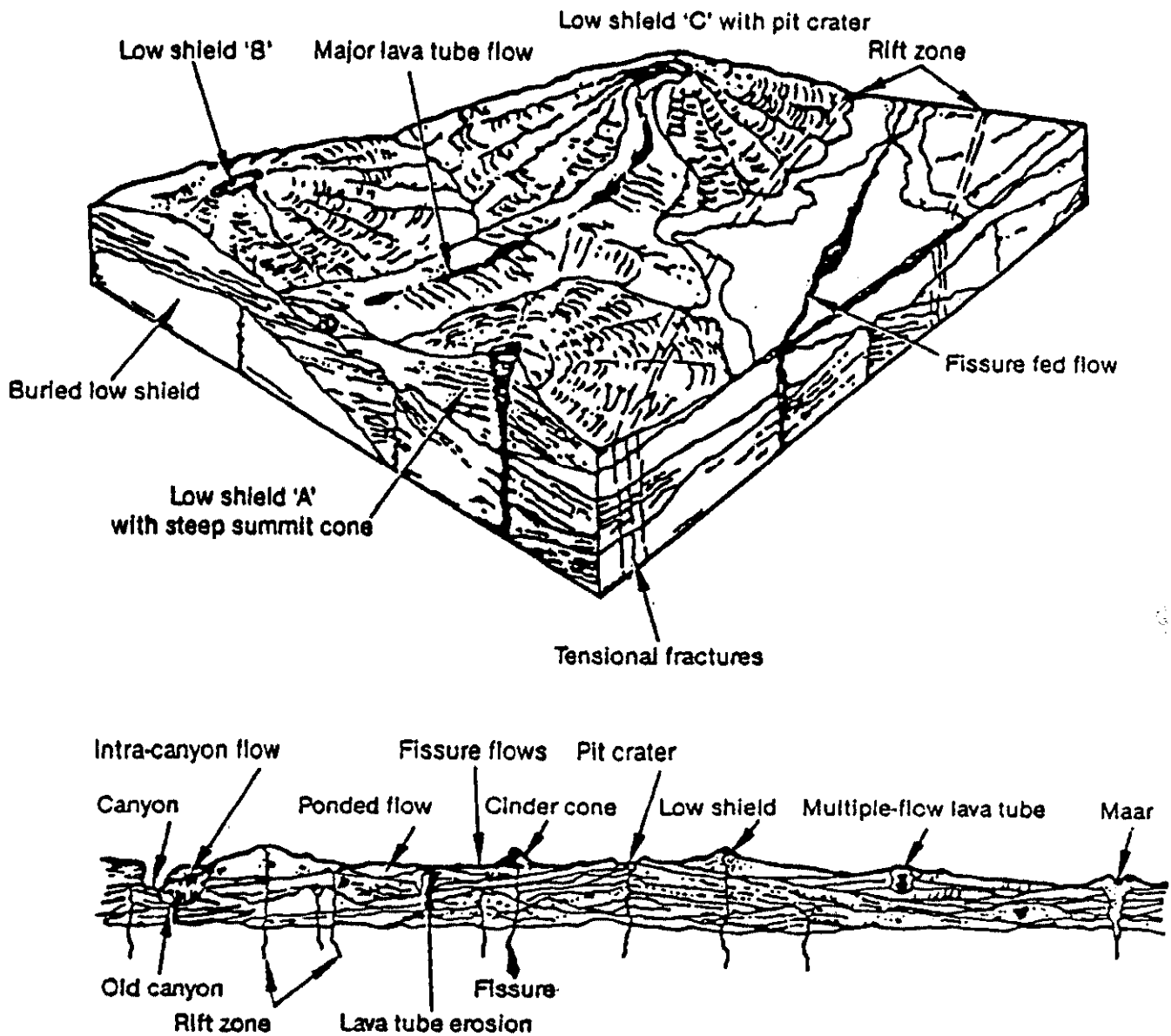
#### **3.4.1 Seismic Activity**

The seismic activity of eastern Idaho is concentrated along the Intermountain Seismic Belt, which extends more than 800 miles from southern Arizona, through eastern Idaho, to western Montana (Figure F-5). The Idaho seismic zone, one of two zones in this belt, extends from the Yellowstone Plateau area westward into central Idaho. Minor earthquakes have occurred on the eastern Snake River Plain, east and north of the INEL.

The largest earthquake recorded for the Idaho seismic zone occurred on October 28, 1983, measuring 7.3 on the Richter scale. This earthquake resulted from movement along a range-front fault. The epicenter was approximately halfway between Challis and Mackay, and the faulting broke the surface for 25 miles along the western base of the Lost River Range. Although the earthquake was felt at the INEL, all facilities remained undamaged. Table F-1 lists the largest earthquakes in the eastern Snake River Plain area since 1884 (Bowman et al., 1984).

#### **3.4.2 Volcanic Hazard**

The main volcanic hazard for the NRF is from potential lava flows from source vents offsite. The potential exists for lava flows to inundate the complex from future eruptions.



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Figure F-4 Block Diagram Showing the Relationship of Low Shields, Major Lava Tubes Flows, and Fissure Flows as they Relate to the "Plains" Style of Basaltic Volcanism (Source: Greely, 1982)

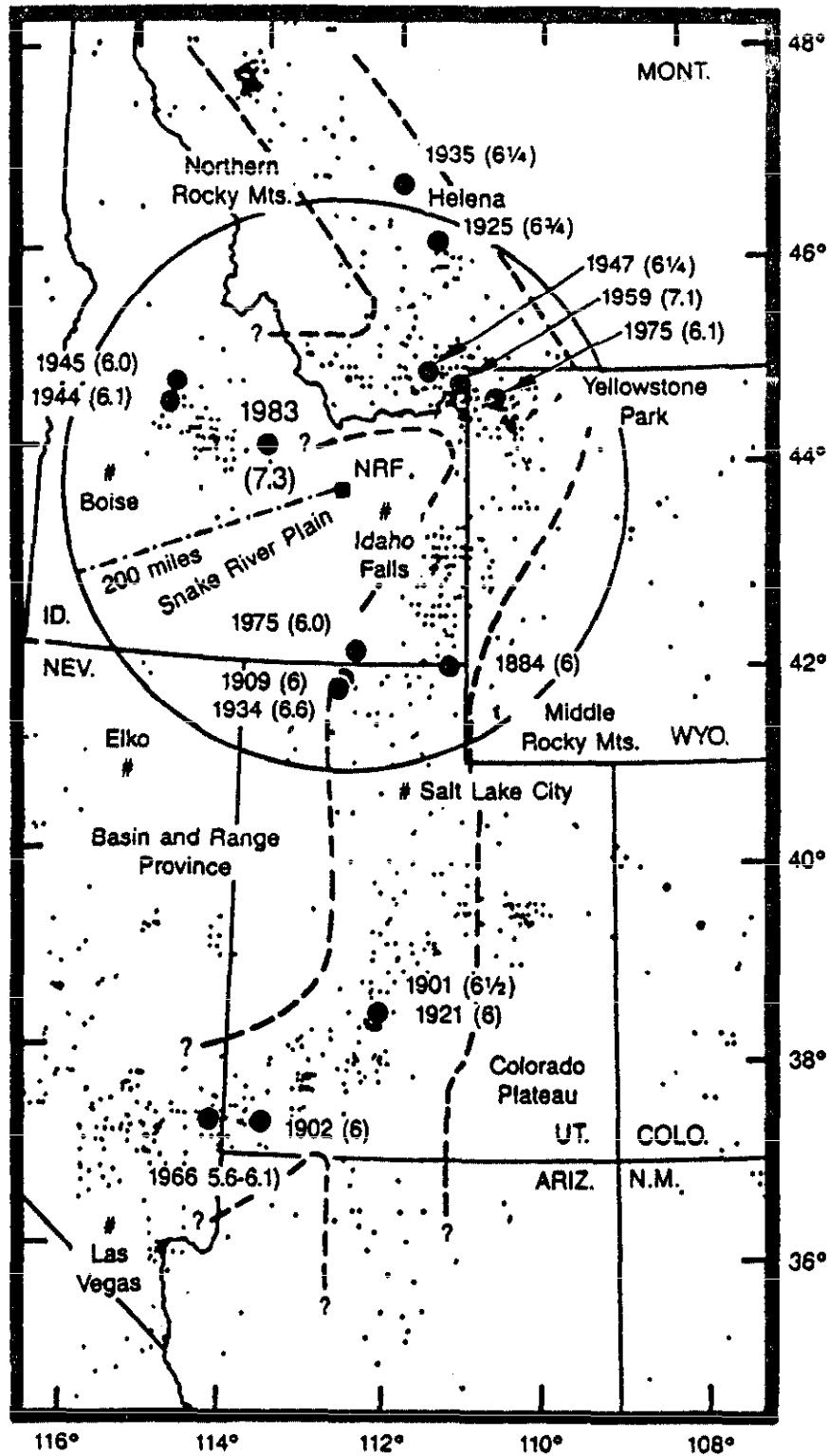


Figure F-5 Locations of Earthquakes Greater than Magnitude 6.0 (Adapted from Richins et al., 1987)

Table F-1 - Largest Earthquakes in Regions Surrounding the Eastern Snake River Plain Since 1884

Date	Latitude	Longitude	Magnitude	Location
November 10, 1884	42.0	111.3	6	Bear Lake Valley <sup>a</sup>
October 5, 1909	41.3	112.7	6	Hansel Valley, U <sup>a</sup>
June 27, 1925	46.0	112.2	6.75	East of Helena, MT <sup>a</sup>
March 12, 1934	41.7	112.3	6.6(M <sub>s</sub> )	Hansel Valley, UT <sup>a</sup>
October 31, 1935	46.6	112.0	6.25	Helena, MT <sup>a</sup>
July 12, 1944	44.7	115.2	6.1	Helena, MT <sup>a</sup>
February 13, 1945	44.7	115.4	6.0	Seafoam, ID <sup>a</sup>
November 23, 1947	44.3	112.0	6.25	Southwestern, MT <sup>a</sup>
August 17, 1959	44.3	111.1	7.1	Hebgen Lake, MT <sup>a</sup>
August 18, 1959	44.3	110.7	6	Yellowstone Park, WY <sup>b</sup>
August 18, 1959	44.3	111.6	6.25	Southwestern MT <sup>b</sup>
March 27, 1975	44.8	110.5	6.1(M <sub>b</sub> ) <sup>c</sup>	Pocatello Valley,
			6.0(M <sub>L</sub> M <sub>s</sub> )	ID-UT border <sup>a</sup>
June 30, 1975	44.8	110.6	6.1(M <sub>L</sub> ) <sup>d</sup>	Yellowstone Park, WY <sup>a</sup>
			5.9(M <sub>s</sub> )	
October 28, 1983	44.05	113.89	7.3	Borah Peak, ID

- a. Includes mainshocks (or largest swarm events) of magnitude 6.0 or greater (or M.M. intensity VIII for pre-instrumental shocks from 1852 through July 1980).
- b. Part of 1959 Hebgen Lake earthquake sequence.
- c. M<sub>s</sub> is the magnitude of the surface waves.
- d. M<sub>L</sub> is the local magnitude.

Source: Bowman et al., 1984

## **4.0 SURFACE WATER HYDROLOGY**

### **4.1 Regional Surface Water Hydrology**

The INEL lies almost entirely in the Pioneer Basin, a closed topographic depression located on the Snake River Plain (see Figure F-6). The Pioneer Basin receives intermittent surface flow from three drainage basins to the north and west, Big Lost River Basin, Little Lost River Basin and Birch Creek Basin (see Figure F-6) (Niccum, 1973). The Big Lost River and Pioneer Basins range in elevation from about 4700 to over 12,600 feet above mean sea level (msl). The largest runoff periods in the area of the basins at lower altitudes have historically occurred during January, February, and March. The maximum runoff from the highlands usually occurs in May or June. In the Pioneer Basin, the ground thaws in March or April, preparing the soil to accept surface water by infiltration a month or two before the snowpack in the higher elevations melts (Niccum, 1973).

The greatest amounts of precipitation occur on the mountain slopes of the three basins bordering Pioneer Basin. An annual maximum of 50 inches of precipitation has been recorded in the higher elevations between the Big Lost River and the Little Lost River Basins. Pioneer Basin receives an average of eight inches of precipitation annually, but variations ranging from five to over 14 inches of total annual precipitation have been recorded between 1950 and 1965 (Barraclough et al., 1976). This precipitation range affects the amount of infiltration and percolation to the water table.

### **4.2 Big Lost River**

The Big Lost River is the main surface water feature of the Big Lost River and Pioneer Basins. The confluence of the East Fork and North Fork form the Big Lost River's main stem, located about 22 miles northwest of Mackay Dam which impounds the river approximately four miles northwest of Mackay (see Figures F-6 and F-7). The drainage basin above the dam has an area of 788 square miles. The dam controls a significant portion of the natural stream flow and stores runoff for irrigation (Koslow and Van Haaften, 1986).

The Big Lost River flows southeast from Mackay Dam down the Big Lost River Valley past Arco into the Pioneer Basin (see Figure F-7). Southeast of Arco, the river enters Box Canyon, a narrow canyon approximately seven miles long with an average height of 70 feet and a width of 130 feet. Fractured basalt composes the canyon's nearly vertical walls. The river exits Box Canyon and flows to the INEL Diversion and Spreading Areas, constructed in 1958 to divert high runoff flows away from the INEL facilities. Flows not diverted at the INEL diversion dam pass north across the INEL site in a shallow, gravel-filled channel. This main channel branches into several channels 18 miles northeast of the diversion dam, forming four shallow sinks, referred to as the Big Lost River Sinks (Koslow and Van Haaften, 1986).

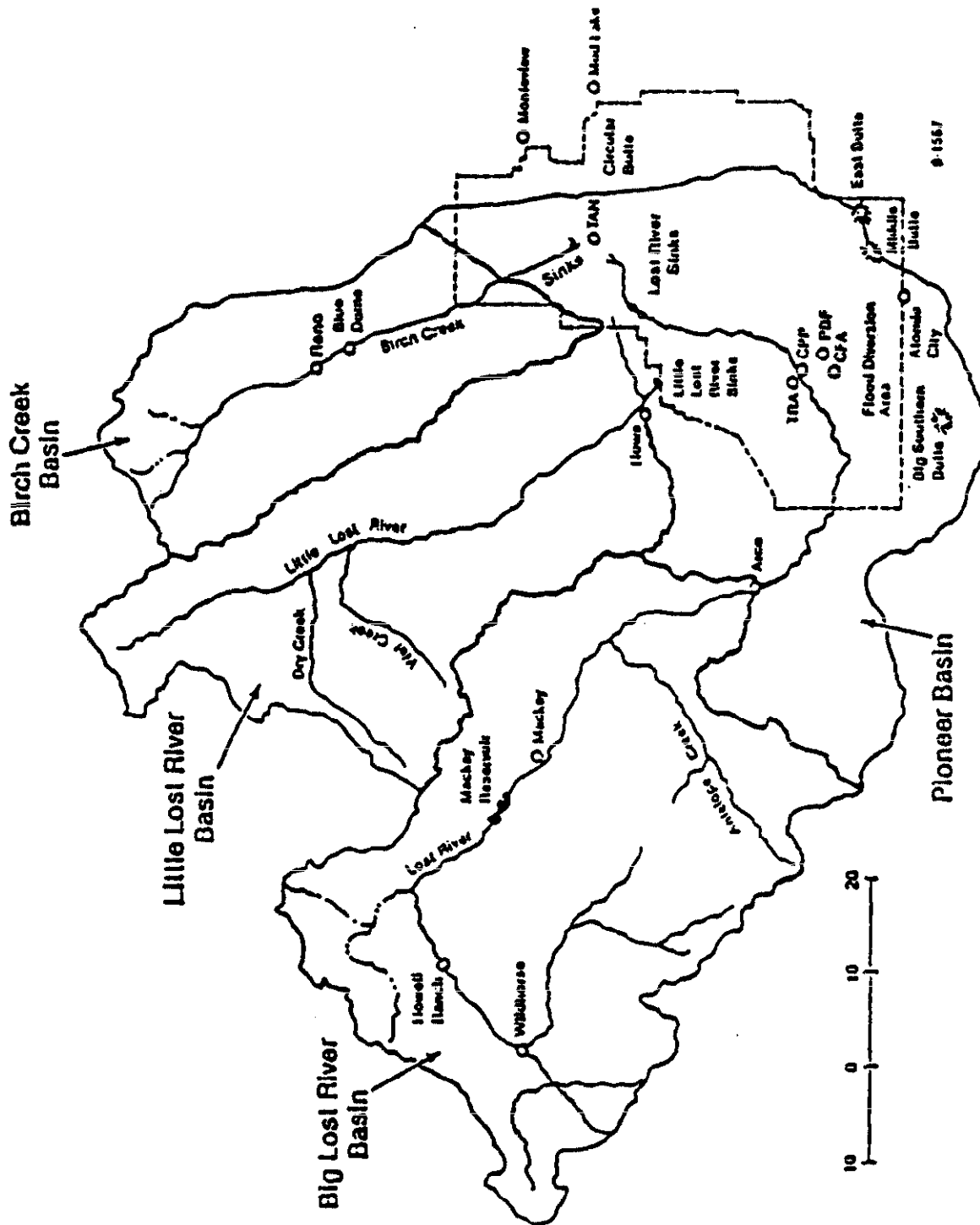
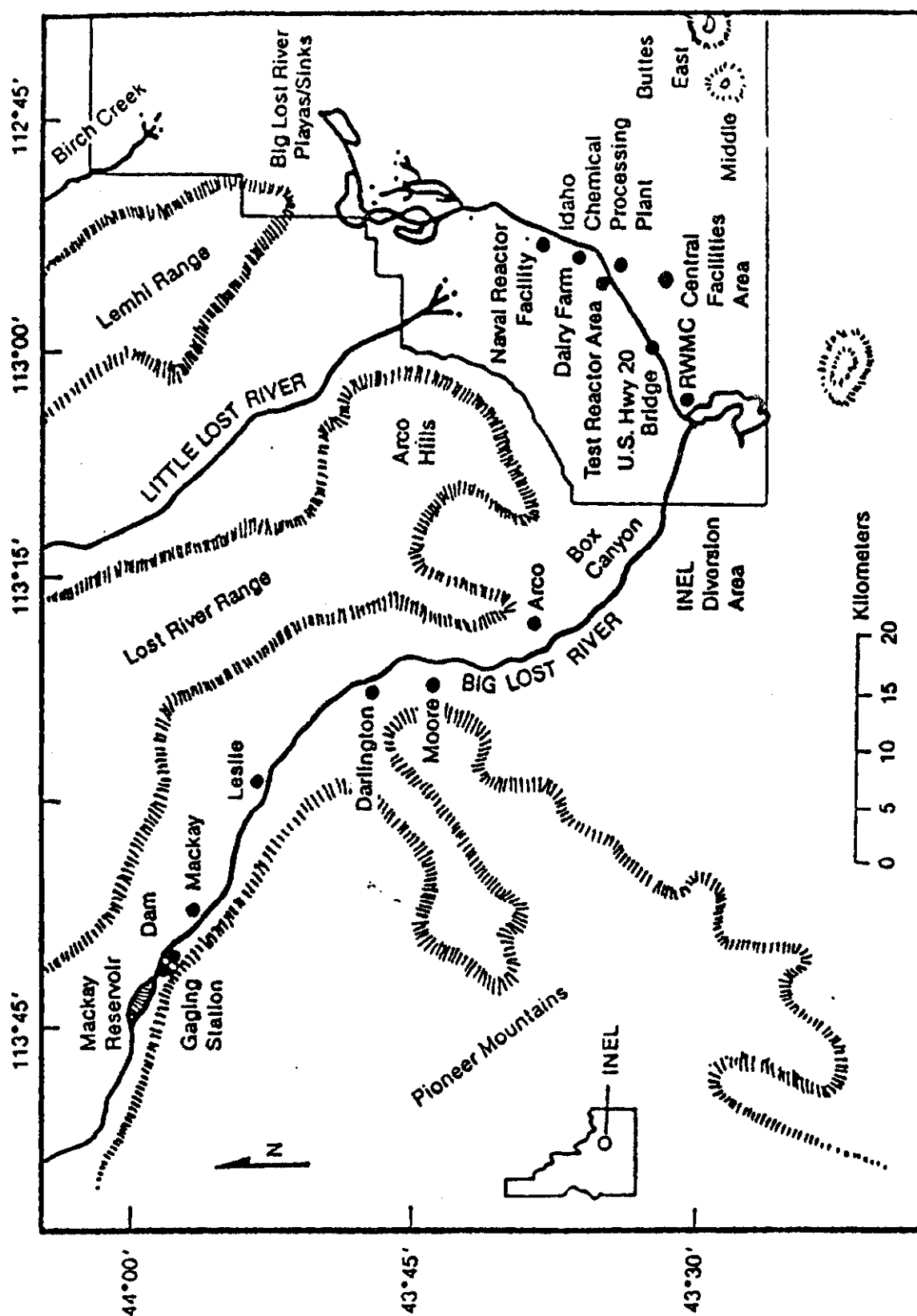


Figure F-6 Drainage basins affecting NEL (Source: Niccum, 1973)



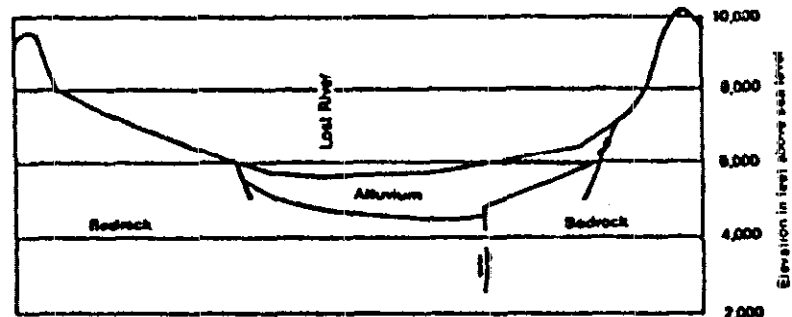
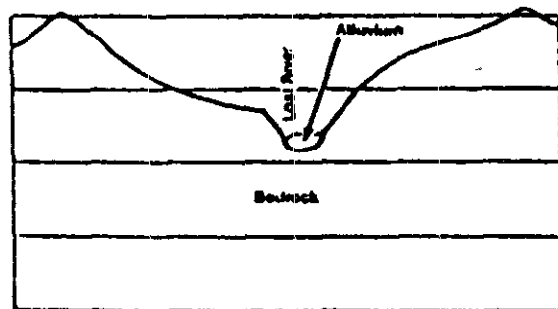
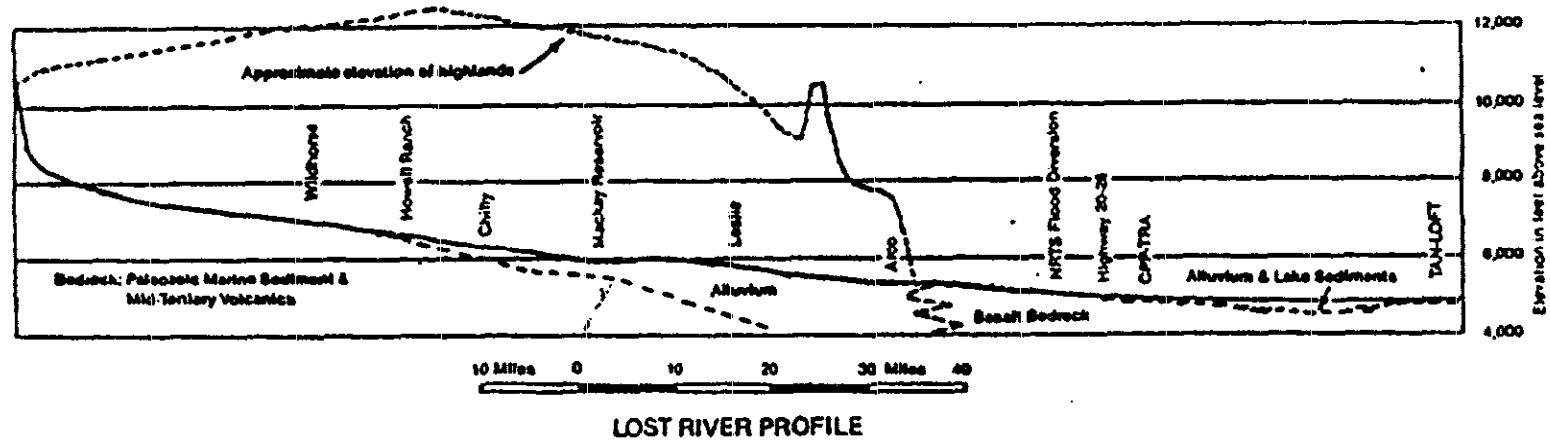
9-1565

Figure F-7 Sites along the Big Lost River downstream from Mackay Reservoir

The two northeast-trending tributaries of the Big Lost River generally flow through bedrock valleys and undergo minimal surface water losses to ground water underflow until they join the main northwest trending valley. The river leaves the bedrock valley near Howell Ranch and flows over deep alluvium where infiltration rates are high (see Figure F-8). The drainage characteristics change at Arco. The river flows over a broad, flat flood plain underlain by basalt for the first few miles below Arco (Niccum, 1973). Surface drainage is confined to the Pioneer Basin in the INEL, and no surface water enters the Snake River (Koslow and Van Haaften, 1986). Any Big Lost River waters not diverted for irrigation purposes are lost to evaporation or percolate to the water table, recharging the Snake River Plain Aquifer. Infiltration and depression storage losses are most significant in Box Canyon and the Big Lost River Sinks due to fractured basalt. Only in times of heavy runoff does the Big Lost River flow to its terminus at the Sinks in the northwest corner of the INEL (Koslow and Van Haaften, 1986).

The flow of the Big Lost River is measured at the gaging stations operated by the USGS below the Mackay Reservoir (30 miles northwest of Arco) and at the INEL diversion. The average annual discharge for 69 years of record for the Big Lost River, as measured at the Mackay gaging station, is 227,500 ac-ft/yr (Pittman et al., 1988). The main river channel flow just below the INEL diversion was 70,000 ac-ft in 1974, and the INEL diversion channel flow in the same year was 32,000 ac-ft (see Figure F-9). In 1975, a total of 88,000 ac-ft flowed down the main channel of the Big Lost River and 46,000 ac-ft flowed through the INEL diversion channel. In 1976, only 38,000 ac-ft flowed through the main channel and 18,000 ac-ft flowed through the INEL diversion channel (Barracrough et al., 1981). Flow increased markedly from 1981 to 1984 with a total of 476,000 ac-ft at the diversion in 1984, the highest rate yet recorded. In 1984 and 1985, flow in the main channel was maintained at 57,000 ac-ft/yr (Pittman et al., 1988).

The diversion channel was excavated through several basalt ridges and intervening surface sedimentary deposits to connect the Big Lost River with a series of natural depressions. The depressions are designated as spreading areas A, B, C, and D. Water is diverted into the diversion channel by a low earthen dam across the Big Lost River. The dam is part of a long, continuous dike extending along the north side of the river to the spreading areas. Two 6 feet-diameter corrugated metal pipes permit passage of less than 900 cfs of water through the dam into the main course of the river flowing downstream into INEL (Lamke, 1969). Flow in the river is regulated by gates on the culverts. During floods, flow in excess of that allowed to pass through the culverts is carried by the diversion channel; flow in the diversion channel is uncontrolled at discharges that exceed the capacity of the culverts.



9-1846

Figure F-8 Profile and Section of the Big Lost River

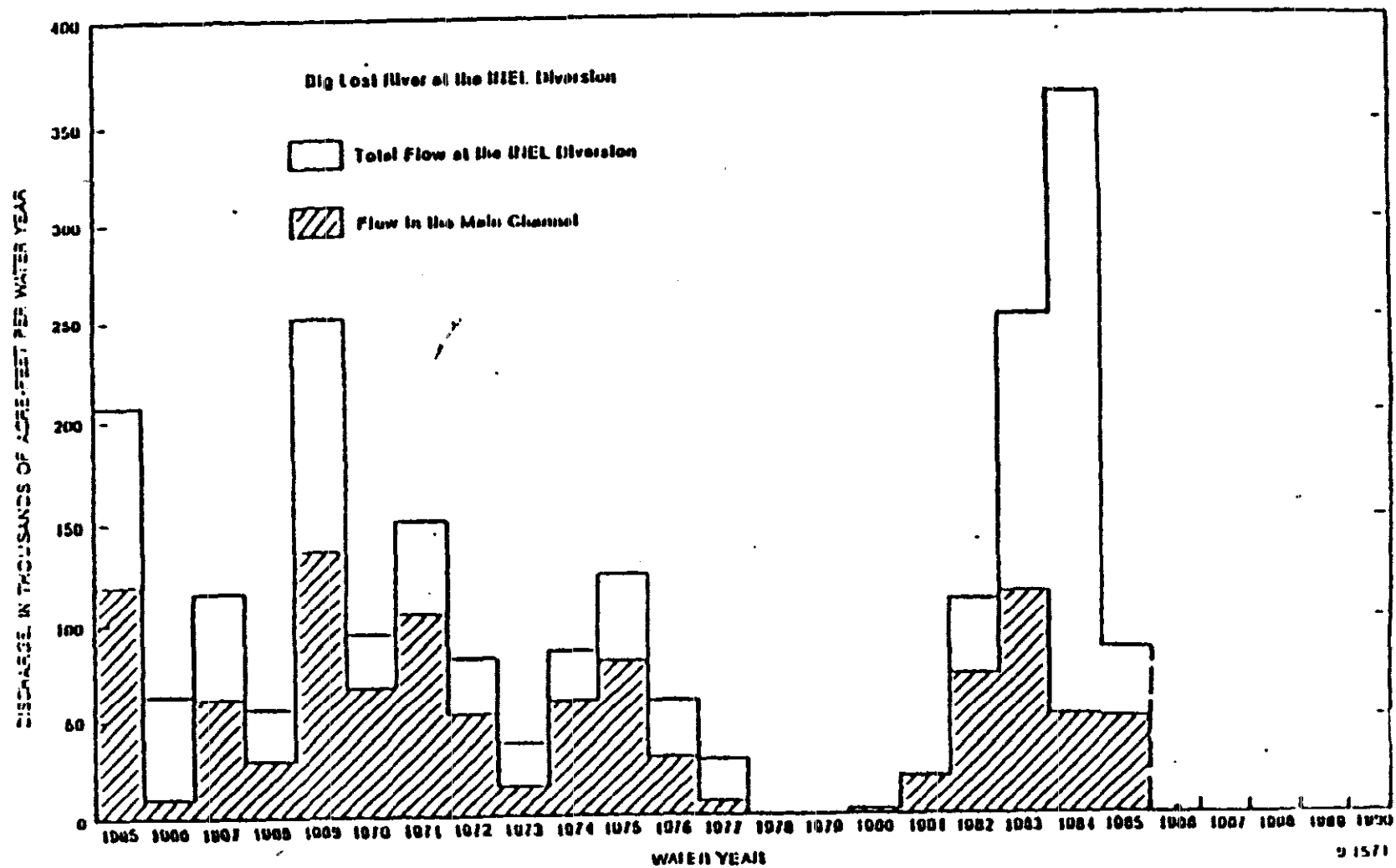


Figure F-9 Discharge of the Big Lost River at the INEL Diversion Channel (Source: Plittman et al., 1988)

The diversion channel is capable of carrying 7200 cfs from the Big Lost River into the spreading areas. Two low swales located southwest of the main channel can carry an additional 2100 cfs, for a combined maximum diversion channel capacity of 9300 cfs. The diversion channel extends about 0.9 miles from the point of diversion to Spreading Area A. Water flows from Spreading Area A through a short connecting channel into the three other spreading areas (Bennett, 1986). The total capacity of the spreading areas is 18,200 ac-ft at elevation 5,040 feet above msl and 58,000 ac-ft at elevation 5050 feet above msl (McKinney, 1985).

The configuration of the channel is unusually rough. Resistant basalt ridges create an irregular channel bottom which cause riffles and waterfalls at low to medium flows. The containment dike forms the east bank of the diversion channel. Basalt boulders, up to 5 feet in diameter, serve as rip-rap along the lower part of the dike. The upper part of the dike is predominately gravel. Scalloped areas, depressions, and basalt ridges form the west bank. The west bank overflow section is sparsely to moderately covered with vegetation, chiefly sagebrush and grass (Bennett, 1986).

#### **4.3 Surface Water Use**

The NRF water needs are met by groundwater supplied by four active production wells, only two of which (wells NRF-1 and NRF-2) are used for drinking water (See Figure F-10). All four wells are located within NRF's boundaries and all draw their water from the Snake River Plain Aquifer. The surface water runoff is not used for domestic or industrial purposes, but it may be used by animals and plants. Surface water in the IWD attracts wildlife and waterfowl to the area.

## **5.0 GROUNDWATER HYDROLOGY**

### **5.1 Site Specific Hydrologic Conditions**

The general character of water in the Snake River Plain Aquifer below the INEL varies. The groundwater on the east side of the INEL contains more sodium and potassium, indicating that the recharge to that part of the aquifer originates in the silicic volcanic-dominated mountains to the north and northeast of the site (Lewis and Jensen, 1984).

The groundwater from the Snake River Plain Aquifer below the INEL is relatively low in total dissolved solids (an average of slightly more than 200 mg/L) (EG&G, 1988). The low mineralization reflects the moderate to abundant precipitation in the mountainous source areas, the absence of extensive deposits containing soluble minerals, and the low solubility of the basalt that forms the principal aquifer system. The water in the aquifer is generally of high quality, and with modest treatment, can be made suitable for most uses.

The Snake River Plain Aquifer is the only source of water used at the INEL. Pumpage rates and their effect on aquifer water levels are closely monitored by the USGS. Pumping has a very limited and localized effect on annual water-level changes in the aquifer in the vicinity of the NRF Production Well because the amount of groundwater pumped is small in proportion to the total aquifer storage and recharge (Barraclough et al., 1981).

### **5.2 Groundwater Use**

The primary uses of groundwater at the NRF include fire safety, cooling water, plant operations, and domestic uses. This groundwater is supplied by the NRF Production Wells NRF-1, NRF-2, NRF-3, and NRF-4.

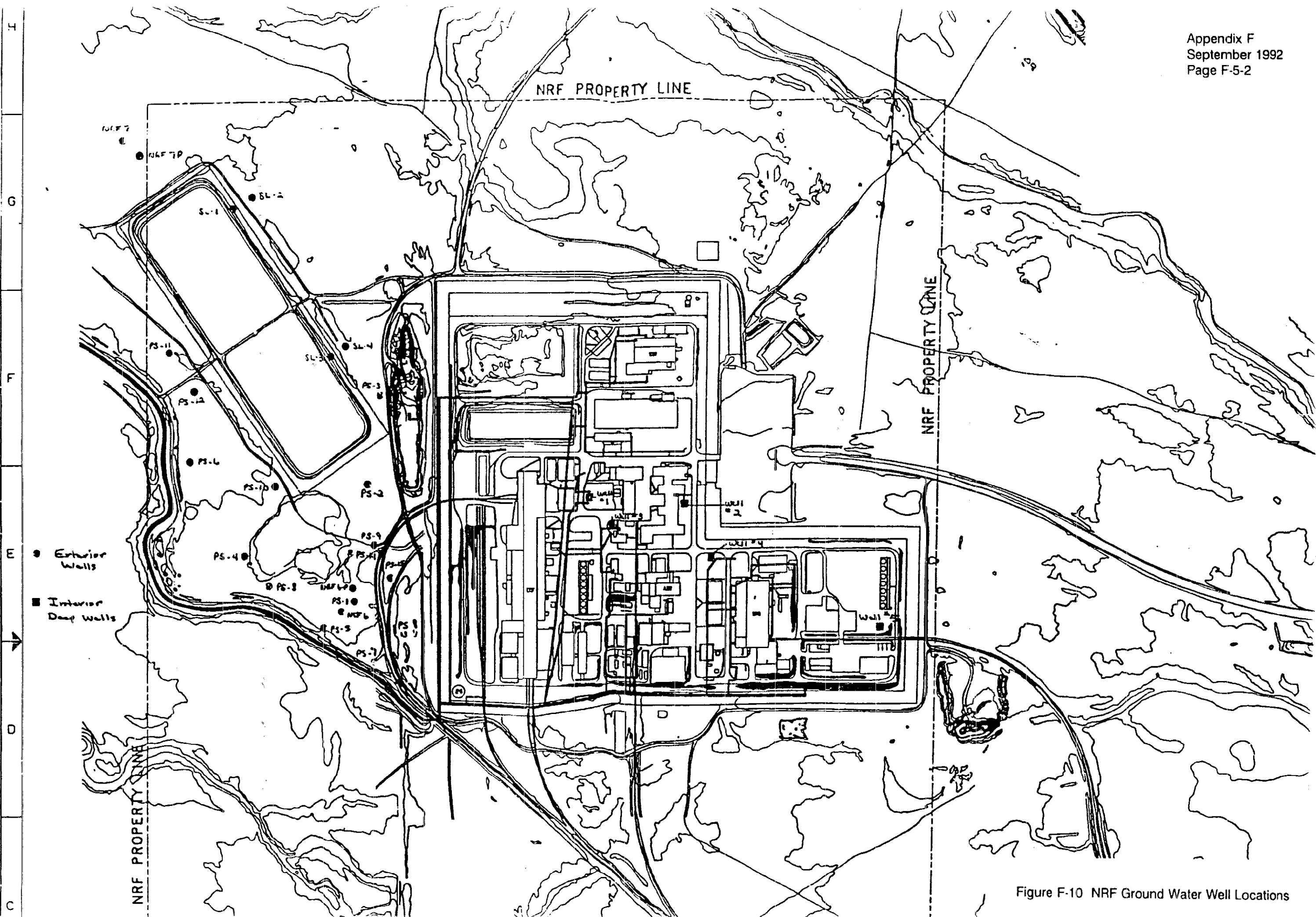


Figure F-10 NRF Ground Water Well Locations

## **6.0 ECOLOGY AT NRF**

### **6.1 Surrounding Land Use**

The INEL has been committed to energy research and development and was designated a National Environmental Research Park in 1975. Approximately 95% of the 890 square mile area has been withdrawn from the public domain. The remaining 5% is controlled by the DOE. A series of Public Land Orders dating to 1946 established the present uses of the INEL. Lands originally under the control of the Bureau of Land Management were withdrawn from the public domain under three principal Public Land Orders. Six other Public Land Orders pertaining to INEL lands have been issued. These orders primarily concern the managerial transfer of responsibilities (Bowman et al., 1984).

Approximately 330,000 acres of the INEL are open to grazing by cattle or sheep. Figure F-11 presents a map of grazing areas relative to the NRF. These areas at the INEL are mutually agreed to by the DOE and the Department of the Interior. Grazing permits are administered through the BLM. Grazing is prohibited within two miles of any nuclear facility and livestock populations are controlled. No dairy cows are allowed in the area (Bowman et al., 1984).

Crops grown in Sectors 10-12 within 50 miles of the INEL include alfalfa, hay, and grains (Bowman et al., 1984). Livestock in these sectors, approximately 22,000 animals, include cattle, and sheep; no dairy cows are raised in these sectors (Bowman et al., 1984).

### **6.2 Biota**

#### **6.2.1 Flora**

The 500,000 acres of the INEL are located on the eastern end of the basaltic Snake River Plain in a desert community that is typical of the Great Basin Region. This area is dominated by big sagebrush, green rabbit brush, bluebunch wheatgrass, and Indian ricegrass (McBride et al., 1978; and Cholewa and Henderson, 1983). The INEL is a mosaic of over 20 vegetation communities and almost 400 plant species (Table F-2). Sagebrush provides the largest habitat on the INEL, and is important to many animal species. Juniper communities occur in the northwest and southeast portions of the INEL. These communities are generally associated with increasing elevation, and are found near East and Middle Buttes and in the foothills of the Lemhi Range. Although these communities are restricted in their distribution, they provide important nesting habitat for raptors and are used by a variety of passerines.

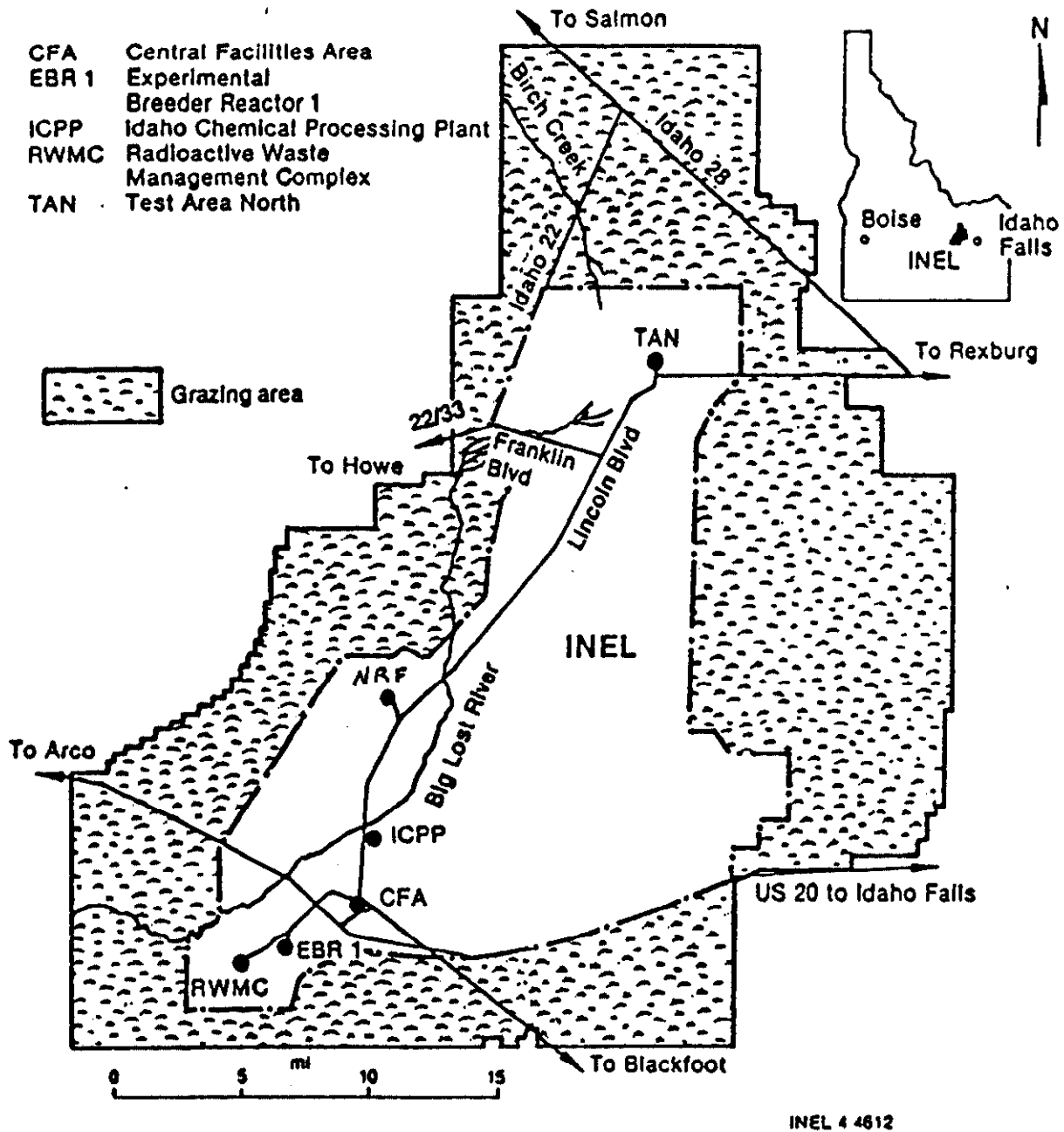


Figure F-11 Permitted Grazing Areas at the INEL

Crested wheatgrass seedlings are common throughout the INEL. These have flourished on the INEL since the 1950's when they were planted on disturbed sites. A grass community dominated by Indian ricegrass also occurs in a relatively narrow band near the eastern border of the INEL. Previously an old burn site, it contains other disturbance species such as needle-and-thread, squirreltail, halogeton, and Russian thistle, which probably colonized the area after the burn (Cholewa and Henderson, 1983).

Irrigated farmland intersperses with sagebrush habitats and borders much of the INEL. Much farmland is planted with alfalfa, but fields of wheat, potatoes, and irrigated pasture are also planted (Gates, 1983). These areas are used extensively by a number of passerine species, as well as by four species of game birds: mourning doves; pheasants; gray partridge; and sage grouse. About 37% of the INEL is grazed by cattle and sheep.

Aquatic habitat on the INEL consists of evaporation and percolation ponds known as sinks or playas, which are located at the termination of the Big Lost River. Plains cottonwood is the primary riparian species that is sparsely distributed along the river flood plain. Four of the sinks or playas that exist in the area have not contained water since at least 1986. Two of these areas contained water in 1967, 1970 to 1975, and 1982 to 1986. A third area was flooded in 1969, 1971, and 1983, while the fourth has been dry for at least the last twenty years. When flooded, littoral plants in these areas have included thistle, speedwell, wild lettuce, cheatgrass, wild barley, and willow. Sedges, cattails, and rushes are common macrophytes. Small man-made ponds approximately 0.5 to 4.0 acres occur at several INEL facilities and receive some use by waterfowl (Halford and Markham, 1983).

Common plant species occurring at the INEL are in Table F-2. All plant species identified have been compiled in a computer data system (Floyd and Anderson, 1983) and additional plant summaries are available for the site (Shumar, 1983; and Floyd and Anderson, 1983).

No plants on the federal list of endangered or threatened species have been observed on the INEL (Cholewa and Henderson, 1983). Astragalus ceramicus var. apus and A. purshii var. ophiogenes, were under review for threatened or endangered status; they were dropped from the Federal Review List because they were more abundant than previously believed (Federal Register, 1983). It was once thought that this species occurred at the INEL. However, further study revealed these plants had an unusual color morphology as compared to A. purshii var. glareosus. Thus, A. purshii var. ophiogenes has not been positively identified at the INEL.

Four species, currently listed on the State Watch List, occur at the INEL including Corypantha missouriensis, Gymnosteris nudicatilis, Oxthea dendriodea, and Lesquerella kingii (Chowela and Henderson, 1983; and Idaho Rare Plant Meeting, March 25, 1989). Plants on the Idaho State

Watch List are considered rare and of special interest in Idaho, but their populations are not in jeopardy, as they may be common elsewhere (Chowela and Henderson, 1983). C. missouriensis was found on a sample site in the northwest corner of the INEL at the head of a small side canyon in the southern Lemhi Range. No immediate threats to this population were identified at the INEL (Chowela and Henderson, 1983). Four distinct populations of G. nudicatulis were found in the southwest corner. Three were on a gravelly substrate and one was on sandy-silt on the side of a volcanic cone (Chowela and Henderson, 1983). All locations were inside the no-grazing boundary at the INEL. Potential threats to these include loss of habitat due to gravel extractions. Most populations were found on flood plain gravels, with one occurring next to an active gravel pit (Chowela and Henderson, 1983). O. dendroldea was found at eight locations in shady areas, primarily in the south-central portion of the INEL site. No apparent threats to these populations were identified (Chowela and Henderson, 1983). In addition, L. kingii was observed at three locations in the southeast section. No apparent threats to these populations have been identified (Chowela and Henderson, 1983). Additional information on these species is presented by Bowman et al. (1984), and Chowela and Henderson (1983).

#### 6.2.2 Fauna

A diverse insect population consisting of at least 150 families and 14 orders occupies the INEL rangeland ecosystems (Stafford and Barr, 1983). Insects are essential components of complex food chains. They are involved in decomposition of plant and animal material, pollination, aeration, and soil turnover (Halford, 1981; Stafford and Barr, 1983; and Stafford, 1984). One amphibian and nine reptilian species occur; the more common species are listed in Table F-2.

At one time or another during a typical year, 159 bird species are found on the INEL, and 14 additional species have been listed as possible occurrences (Arthur et al., in press). Twenty-nine species of game birds have been recorded on the INEL, which provides important wintering and breeding habitat for the species (Connelly, 1982; and Connelly and Ball, 1983). The pheasant, gray partridge, chukar, blue grouse, and mourning doves are uncommon; only one observation of a blue grouse has been reported on the INEL. Additional game species at the INEL are listed in Table F-2.

Sixty-nine species of passerines have been recorded on the INEL (Arthur et al., in press). The most common species include the horned lark, black-billed magpie, American robin, sage thrasher, Brewer's sparrow, sage sparrow, and western meadowlark (Table F-2). These species occur throughout the INEL. The sage sparrow, Brewer's sparrow, and the sage thrasher are the most common nongame bird species breeding on the INEL (Peterson and Best, 1983).

The INEL is an important nesting and wintering area for 22 species of raptors. American rough-legged hawks, American kestrels, prairie falcons, and golden eagles are the most abundant raptors observed on the INEL during the non-breeding season. During the winter of 1981-82, most observations of raptors at the INEL included American rough-legged hawks (555 observations) and golden eagles (208 observations) (Craig et al., 1983). The most abundant breeding raptors on the site are American kestrels and long-eared owls (Craig, 1979). Most raptor nests are restricted in distribution and are located in deciduous trees along the Big Lost River and in Juniper stands near Kyle Canyon in the northwest portion on the INEL or near Twin Buttes to the southeast. Additional raptors occurring at the site are indicated in Table F-2.

Eighteen of the 37 mammal species at the INEL are rodents (Arthur et al., in press). The Townsend's ground squirrel, least chipmunk, Great Basin pocket mouse, Ord's kangaroo rat, western harvest mouse, deer mouse, bushy-tailed wood rat, and the montane vole are the most common small animals on the INEL. These animals are also relatively common throughout sage brush regions of the Intermountain West. Additional mammals occurring at the INEL are indicated in Table F-2. Five species of bats occur in the lava-tube caves on and adjacent to the INEL (Table F-2). The small-footed myotis and Townsend's big-eared bat hibernate on the site, while the remaining bat species are considered migratory (Markham, 1987).

Four species of rabbits occur on the INEL; black-tailed jack rabbits, white-tailed jack rabbits, Nuttall cottontails, and pygmy rabbits (Table F-2). All but the white-tailed jack rabbits are considered abundant. In addition, six species of carnivores occur on the INEL. Of these, the coyote, long-tailed weasel, and the badger are considered common (Arthur et al., in press). The bobcat ranges throughout the INEL, but is generally uncommon. The mountain lion is considered rare. The spotted skunk is generally uncommon, but can be found in basalt outcrops.

The INEL supports resident populations of mule deer and pronghorn. Mule deer are considered uncommon and are generally concentrated in the southern and central portion of the INEL. They occur in greater numbers on the buttes and mountains surrounding the INEL. Pronghorn are found throughout the INEL and are generally considered abundant (Arthur et al., in press). Most pronghorn in southeastern Idaho are migratory (Hoskinson and Tester, 1980). During winter months, 4500 to 6000 pronghorn, or about 30% of Idaho's total population, may reside on the INEL. In addition, elk (Cervus elaphus) may be expanding their range into the INEL, as indicated by the recent increase in elk sightings (Markham, 1987).

The bald eagle and the American peregrine falcon are the only species observed on the INEL that are classified as federally-endangered. A total of 65 observations of bald eagles were made at the INEL during the winter of 1981 -1982. Seventeen eagles were observed roosting in

Howe, Idaho, just west of the INEL (Craig et al., 1983). Bald eagle counts that were conducted once each year during mid-winter surveys are as follows; 4 (1983), 3 (1984), 2 (1985), 5 (1986), and 1 (1987) (Markham, 1987). No nest sites have been reported in the area. The peregrine falcon has been observed infrequently on the northern portion of the INEL (Arthur et al., in press). The population status, roosting requirements, and dispersal of this species is currently being studied at the INEL and results of these studies will be presented in future publications (Markham, 1987).

Several species of wildlife observed on the INEL are of special concern to the Idaho Department of Fish and Game (Gleisner, 1983) and the Bureau of Land Management. These species include the ferruginous hawk, merlin, osprey, burrowing owl, white-faced ibis, long-billed curlew, and bobcat. However, only the ferruginous hawk, burrowing owl, long-billed curlew, and bobcat occur regularly on the site.

The INEL lies within the Pacific and Central Flyways, which are used by a variety of migratory songbirds, waterfowl, and raptors. Most ducks use the INEL man-made ponds and flooded playas as resting areas during migration, and therefore, may act as important vectors in transporting contaminants accumulated across aquatic trophic levels (Halford and Markham, 1983). In addition, each of the raptor species in the area (Table F-2) is likely to migrate or undergo seasonal movements across the INEL. Consequently, raptors could also act as a significant pathway for transport of radionuclides or other contaminants across terrestrial trophic levels and may be important in dispersing contaminants out of the INEL.

### **6.3 Fauna at the IWD**

In 1988, NRF initiated a detailed ecological survey to identify use patterns associated with the Industrial Waste Ditch (IWD). Preliminary results of the survey indicate that the ditch fills a significant ecological role at the INEL by providing a unique source of water and habitat in a normally arid environment. The existence of the ditch at the INEL for over 30 years has provided a means for flora and fauna to establish long term niches and usage patterns. Significant observations of various fauna are detailed as follows:

#### **6.3.1 Antelope**

During summer months, the antelope population at the INEL is limited to outlying agricultural areas. However, in the late summer, irrigation water to wheat crops is eliminated and large numbers of antelope migrate into the INEL and to the IWD for water. NRF is located seven miles west of Howe, Idaho and associated agricultural areas. In August, 1988, several antelope were counted in a period of one week along the IWD.

### **6.3.2 Sage Grouse**

In the late spring, sage grouse clutches (2-3) hatch along the borders of the IWD.

### **6.3.3 Ducks**

During the spring, nesting pairs of mallards and teal are observed in the IWD. In 1987, eight pair of ducks hatched clutches along the channel. Occasionally in the late fall, ducks will land in the ditch from flocks migrating south.

Table F-2 Representative Plant and Animal Species Occurring at the INEL

Common Name	Scientific Name
FLORA	
Cactacea (cactus family)	
Pin cushion cactus	<u>Corypantha missouriensis</u>
Chenopodeaceae (Goosefoot family)	
Winterfat	<u>Ceratoides lanata</u>
Shadscale saltbush	<u>Atriplex confertifolia</u>
Nuttall saltbush	<u>Atriplex nuttalli</u>
Compositae (Composite of Sunflower family)	
Big sagebush	<u>Artemisia tridentata</u>
Low sagebush	<u>Artemisia arbuscula</u>
Rabbitbrush	<u>Chrysothamnus</u> spp.
Hawksbeard	<u>Crepis</u> spp.
Yellow salsify	<u>Tragopogon dubius</u>
Wild lettuce	<u>Lactuca serriola</u>
Thistle	<u>Cirsium</u> spp.
Gray horsebrush	<u>Tetradymia canescens</u>
Dandelion	<u>Taraxacum officinale</u>
Cruciferae (Mustard family)	
Bladder pod	<u>Lesquerella kingii</u>
Cupressaceae (Cypress family)	
Juniper	<u>Juniperus</u> spp.
Cyperaceae (Sedge family)	
Sedge	<u>Scirpus</u> spp.
Gramenaeae (Grass family)	
Bluebunch wheatgrass	<u>Agropyron spicatum</u>
Thickspike wheatgrass	<u>Agropyron dasystachyum</u>
Crested wheatgrass	<u>Agropyron cristatum</u>
	<u>Agropyron desertorum</u>
Indian ricegrass	<u>Oruzopsis hymenoides</u>
Needle and thread grass	<u>Stipa comata</u>
Squirreltail grass	<u>Sitanion hystrix</u>
Blue grass	<u>Poa</u> spp.

Table F-2 Continued

Common Name	Scientific Name
FLORA (Continued)	
Gramenaeae (Grass family) - continued	
Great Basin wild rye	<u>Elymus cinereus</u>
Wild Barley	<u>Hordeum jubatum</u>
Cheatgrass	<u>Bromus tectorum</u>
Hydrophyllaceae (Waterleaf family)	
Phacelia	<u>Phacelia inconspicua</u>
Juncaceae (Rush family)	
Painted milk vetch	<u>Astragalus ceramicus</u>
Wooly pod milk vetch	<u>Astragalus purshii</u>
Milk vetch	<u>Astragalus gilviflorus</u>
Milk vetch	<u>Astragalus kentrophyta</u>
Polygonaceae (Buckwheat family)	
Oxytheca	<u>Oxytheca dendroidea</u>
Salicaceae (Willow family)	
Willow	<u>Salix</u> spp.
Plains cottonwood	<u>Populus deltoides</u>
Scrophulariaceae (Figwort family)	
Speedwell	<u>Veronica</u> sp.
Typhaceae (Cattail family)	
Cattail	<u>Typha latifolia</u>

Table F-2 Continued

Common Name	Scientific Name
FAUNA	
Amphibians and Reptiles	
Anura (Amphibians)	
Great Basin spadefoot toad	<u>Spea intermontana</u>
Squamata (Reptiles)	
Short-horned lizard	<u>Phrynosoma douglassi</u>
Sagebrush lizard	<u>Sceloporus graciosus</u>
Gopher snake	<u>Pituophis melanoleucus</u>
Western rattlesnake	<u>Crotalus viridis</u>
Birds	
Ciconiiformes (Heron, Bitterns, and Relatives)	
White-faced ibis	<u>Plegadis chihi</u>
Anseriformes (Ducks)	
Mallard	<u>Anas platyrhynchos</u>
Pintail	<u>Anas acuta</u>
American widgeon	<u>Anas americana</u>
Northern shoveler	<u>Anas clypeata</u>
American green-winged teal	<u>Anas acuta</u>
Redhead	<u>Aythya americana</u>
Lesser scaup	<u>Aythya affinis</u>
Common goldeneye	<u>Bucephala clangula</u>
Bufflehead	<u>Bucephala albeola</u>
Ruddy duck	<u>Oxyura jamaicensis</u>
Hooded merganser	<u>Mergus strepera</u>

Table F-2 Continued

Common Name	Scientific Name
FAUNA (Continued)	
Falconiformes (Hawks and Falcons)	
Osprey	<u>Pandion haliaetus</u>
Bald eagle	<u>Haliaeetus leucocephalus</u>
Ferruginous hawk	<u>Buteo regalis</u>
Rough-legged hawk	<u>Buteo lagopus</u>
Red-tailed hawk	<u>Buteo jamaicensis</u>
Swainson's hawk	<u>Buteo swainsoni</u>
Golden eagle	<u>Aquila chrysaetos</u>
Merlin	<u>Falco columbarius</u>
Peregrine falcon	<u>Falco peregrinus</u>
Gyr Falcon	<u>Falco rusticolus</u>
Prairie Falcon	<u>Falco mexicanus</u>
American kestrel	<u>Falco sparverius</u>
Galliformes (Grouse and Pheasants)	
Gray partridge	<u>Perdix perdix</u>
Chukar	<u>Alectoris chukar</u>
Ring-necked pheasant	<u>Phasianus colchicus</u>
Blue grouse	<u>Dendragapus obscurus</u>
Sage grouse	<u>Centrocercus urophasianus</u>
Gruiformes (Rails and Coots)	
American coot	<u>Fulica americana</u>
Charadriiformes (Shorebirds)	
Long-billed curlew	<u>Numenius americanus</u>
Common snipe	<u>Gallinago gallinago</u>
Columbiformes (Doves and Pigeons)	
Mourning dove	<u>Zenaida macroura</u>
Striniformes (Owls)	
Burrowing owl	<u>Athene cunicularia</u>
Long-eared owl	<u>Asio otus</u>

Table F-2 Continued

Common Name	Scientific Name
FAUNA (Continued)	
Passeriformes (Perching birds)	
Horned lark	<u>Eremophila alpestris</u>
Barn swallow	<u>Hirundo rustica</u>
Black-billed magpie	<u>Pica pica</u>
American robin	<u>Turdus migratorius</u>
Sage thrasher	<u>Oreoscoptes montanus</u>
Western meadowlark	<u>Sturnella neglecta</u>
Brown-headed cowbird	<u>Molothrus ater</u>
Mammals	
Chiroptera (Bats)	
Little brown bat	<u>Myotis lucifugus</u>
Long-eared bat	<u>Myotis evotis</u>
Small-footed myotis	<u>Myotis leibii</u>
Big brown bat	<u>Eptesicus fuscus</u>
Townsend's big-eared bat	<u>Plecotus townsendii</u>
Lagomorpha (Rabbits)	
White-tailed jack rabbit	<u>Lepus townsendii</u>
Black-tailed jack rabbit	<u>Lepus californicus</u>
Nuttall cottontail	<u>Sylvilagus nuttallii</u>
Pygmy rabbit	<u>Sylvilagus idahoensis</u>
Rodentia (Rodents)	
Yellow-bellied marmot	<u>Marmota flaviventris</u>
Townsend's ground squirrel	<u>Spermophilus townsendii</u>
Richard's ground squirrel	<u>Spermophilus richardsonii</u>
Least chipmunk	<u>Eutamias minimus</u>
Great Basin pocket mouse	<u>Perognathus parvus</u>
Ord's kangaroo rat	<u>Dipodomys ordii</u>
Western harvest mouse	<u>Reithrodontomys megalotis</u>
Deer mouse	<u>Peromyscus maniculatus</u>
Northern grasshopper mouse	<u>Onychomys leucogaster</u>
Bushy-tailed wood rat	<u>Neotoma cinerea</u>
Montane vole	<u>Microtus montanus</u>
Sage vole	<u>Lagurus curtatus</u>
Pocket gopher	<u>Thomomys</u> sp.

Table F-2 Continued

Common Name

Scientific Name

Carnivora (Carnivores)

Badger  
Bobcat  
Coyote  
Long-tailed weasel  
Mountain lion  
Spotted skunk

FAUNA (Continued)

Taxidea Taxus  
Lynx rufus  
Canis latrans  
Mustela frenata  
Felis concolor  
Spilogale gracilis

Artiodactyla (Even-toed Ungulates)

Mule deer  
Pronghorn

Odocoileus hemionus  
Antilocapra americana

Source: Based on Surveys of the INEL performed by EG&G, and Arthur et al., 1983

## **7.0 IMPORTANT WILDLIFE HABITATS**

Important habitats are those that are necessary for maintaining a viable wildlife population, or which have a limited distribution on the INEL and could thus be eradicated by perturbation (e.g., a fire). Because many wildlife species on the INEL are sagebrush obligates, either directly or indirectly, all sagebrush habitats within the INEL are considered important. However, the northern end of the INEL contains interspersions of low sagebrush and big sagebrush habitats (McBride et al., 1978; and Connelly, 1982) that provide critical winter and spring range for sage grouse (McBride et al., 1978) and pronghorn (Hoskinson and Tester, 1980).

Juniper communities on and adjacent to the INEL are important to nesting raptors (Craig, 1979) and several species of songbirds. The Big Lost River sinks provide wetlands in an area where this habitat type is generally lacking. When water is present, the sinks are used by a large number of waterfowl and shorebird species (Arthur et al., in press). The relatively limited areas of these habitats and their importance to wildlife suggest that they should also be considered important. In addition, the limited and dispersed plains cottonwoods provide essential nesting locations for numerous raptors at the INEL.

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